SHERIDAN COUNTY CONSERVATION DISTRICT

Septic System Information Packet

Updated June 2005

INTRODUCTION

The purpose of this packet is to provide the homeowner with a starting point on the considerations for installing, replacing, and maintaining a septic system, in addition to providing some basic summaries of alternatives for locations where a conventional system will not protect human health and the environment. The material presented is for general information purposes only. Please contact the Sheridan County Engineer's Office or the Wyoming Department of Environmental Quality for specific requirements regarding any situation. Not all of the alternatives and requirements presented will be suitable or applicable for all situations. Nothing in this packet can replace the advice of a qualified professional.

FOR MORE INFORMATION

Sheridan County Conservation District/USDA Natural Resources Conservation Service
(307) 672-5820 x. 3

Sheridan County Engineer's Office
(307) 674-2920

Wyoming Department of Environmental Quality, Water Quality Division, Sheridan
(307) 672-6488

National Small Flows Clearinghouse
1-800-624-8301
www.nsfc.wvu.edu

AVAILABLE RESOURCES

There are many publications and web-sites about septic systems and other treatment options available. The Sheridan County Conservation District has some of these, please contact the office for a complete list of those available at this office.

A homeowner's guide to Septic Systems. US Environmental Protection Agency. December 2002. EPA-832-B-02-2005

Pipeline. A quarterly publication of the National Small Flows Clearinghouse. West Virginia University.

Regulations Governing Construction of Small Wastewater Facilities. University of Wyoming Cooperative Extension Service. October 1994. Bulletin B-1005.

Septic System Design and Siting. University of Wyoming Cooperative Extension Service. October 1994. Bulletin B-1006.

Septic System Failure: What to do.. University of Wyoming Cooperative Extension Service. October 1994. Bulletin B-1007.

Septic System Maintenance. University of Wyoming Cooperative Extension Service. October 1994. Bulletin B-1008.

Residential On-site Wastewater Treatment. An overview. University of Nebraska, Cooperative Extension. EC-01798.

AUTHORITIES AND APPLICABLE REGULATIONS

WYOMING ENVIRONMENTAL QUALITY ACT (W.S. 35-11-101 THROUGH W.S. 35-11-1207)

- Prohibits construction, installation, modification or operation of a septic system without a permit
- Provides for the delegation of enforcement and administration authorities to municipalities, water and sewer districts or counties

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY, WATER QUALITY RULES AND REGULATIONS, CHAPTER 3: REGULATIONS FOR A PERMIT TO CONSTRUCT, INSTALL, OR MODIFY PUBLIC WATER SUPPLIES, WASTEWATER FACILITIES, DISPOSAL SYSTEMS, BIOSOLIDS MANAGEMENT FACILITIES, TREATED WASTEWATER REUSE SYSTEMS AND OTHER FACILITIES CAPABLE OF CAUSING OR CONTRIBUTING TO POLLUTION

- Prohibits construction, installation, modification or operation of a septic system without a permit
- Provides for the delegation of enforcement and administration authorities to municipalities, water and sewer districts or counties

SHERIDAN COUNTY REGULATIONS FOR A PERMIT TO CONSTRUCT, INSTALL OR MODIFY SMALL WASTEWATER FACILITIES AND RELATED DESIGN STANDARDS

- Describes permit application requirements and process
- Outlines the requirements for conventional septic systems and other wastewater treatment options for residential units.

GENERAL INFORMATION

FUNCTION OF A SEPTIC SYSTEM

- Remove wastewater from the home
- Treat wastewater through a primary and secondary treatment system

RESOURCE AND/OR HEALTH CONCERNS WHEN NOT FUNCTIONING PROPERLY

- Risk of direct contact with sewage or untreated wastewater
- Risk of ground or surface water pollution
- Untreated wastewater may contain pathogens, such as cholera, Hepatitis A, salmonella
    - Can enter drinking water supplies in groundwater
    - Can contaminate recreational areas such as lakes or streams
- Untreated wastewater may contain parasites, such as pinworms and tapeworms
- Untreated wastewater contains nitrates, which is associated with methoglobinemia
- Untreated wastewater may contain phosphorus (from detergents and cleansers)
    - Promotes algae and weed growth in waterbodies
    - Can ultimately result in death of fish and other aquatic organisms

BASIC COMPONENTS AND REQUIREMENTS

SEPTIC TANK

- The septic tank removes and begins treatment of solids from the wastewater.
- Sheridan County Rules and Regulations require:
  - tanks made of non-corrodible material such as pre-cast concrete or fiberglass *(section 23, a(1))*;
  - a minimum size of 1000 gallons for residences up to 4 bedrooms with an additional 250 gallons **per bedroom** for each additional bedroom over 4 *(section 23, a(2)(a));*
  - a tee or baffle for inlets and tee or baffle that extends into the middle third of the water depth for outlets to prevent transport of floating solids into the absorption field *(section 23, a(3)(a));*
  - the inlet pipe to be at least 3 inches higher than the outlet pipe *(section 23, a(3)(a));*
  - a manway access for each compartment with a minimum 20 inch diameter *(section 23, a(4))*;
  - that each compartment has a cleanout with a minimum 6 inch diameter that extends to the ground surface and is capped *(section 23, a(4))*; and
  - placement on a level grade and firm bedding to prevent settling *(section 23, a(5)).*
- Some resources recommend a sufficient capacity to retain wastewater for 48 hours; however, the regulation for commercial units is only 36 hours *(section 23, a(2)(b))*.

ABSORPTION AREA

- The absorption field or trench is a series of underground perforated pipe that filters the wastewater through gravel and soil.
- Sheridan County Rules and Regulations require:
  - that absorption areas are not located beneath compacted areas such as driveways *(section 19 b);*
  - the bottom of the absorption stone be at least 4 feet above bedrock or impermeable soil and the seasonal high water table *(section 20 c (1)).*
  - surface run-off to be diverted away from the absorption area *(section 26 a (3));*
  - soil absorption stone to be sized between ½ - 2 ½ inches *(section 26 a (4));*
  - at least six inches of stone be placed under and beside the system pipe and at least two inches of stone be placed on top of the pipe *(section 26 a (4));*
  - that all plastic gravity absorption system pipes have a minimum diameter of four inches and that pipes be laid with the holes centered around the bottom vertical axis *(section 26 a (5)*;
  - the maximum slope for the pipe three inches per 100 feet *(section 26 a (5)*;
  - the ends to be capped or hooked together to form a complete circuit *(section 26 a (5)*;
  - the absorption stone on top of the piping be covered with filter fabric or other appropriate cover prior to backfilling *(section 26 a (8)*; and
  - at least 12 inches of permeable soil that supports grass be placed over the filter fabric *(section 26 a (9).*

SPECIAL ADDITIONAL REQUIREMENTS FOR MOUNDED SYSTEMS

- Sheridan County Rules and Regulations require:
  - the finished grade to extend at least three feet horizontally beyond the stone and sloped no steeper than 4:1 to the ground surface *(section 26 c (2));*
  - the fill soil to have a minimum percolation rate of five minutes per inch *(section 26 c (3);* and
  - top soil to be placed on top of the mound *(section 26 c (3)).*

DESIGN AND INSTALLATION CONSIDERATIONS

OBTAIN A PERMIT

- Sheridan County Rules and Regulations require:
  - a permit be obtained prior to **any** construction or modification activities; including replacement of an existing septic tank and/or absorption area *(section 7);*
  - the permittee to notify the Sheridan County Engineer at lest 24 hours prior to backfilling the uncovered system for the final inspection of the system *(section 10 d);*
- The permit application is available at the Sheridan County Engineer's office and requires
  - three copies of plans, specifications, design data, and other pertinent information *(section 8 b);*
  - plans to contain name of the owner and location of the project; site plan; detailed drawings, location of percolation test holes and soil test pits; percolation test data *(section 8 c (1) (a-f));*
  - specifications to include information on the construction materials as well as information on all mechanical and electrical equipment *(section 8 c (2) (a-b));* and
  - that all plans and specifications conform to design standards in Sheridan County Rules and Regulations *(section 8 d).*
- A $150.00 fee is required upon submission of the permit application.
- The permit will be issued approximately 15 business days after submission.

DETERMINE THE TYPE OF SYSTEM

- Choose a septic tank that meets size and construction requirements and recommendations.
- Determine the location and type of absorption system: trench or bed.

SELECT APPROXIMATE LOCATION OF NEW SYSTEM

- Do not locate systems beneath compacted areas such as buildings, parking lots, or roadways.
- Include enough room for a replacement area.
- Determine whether the existing grade will be suitable or if modifications to the design are necessary.
- Sheridan County Rules and Regulations require:
  - all absorption systems be located at least 15 feet from the top of any break in slope that exceeds the maximum allowed slope, which corresponds to the percolation rate *(section 20 e(1-2))*;
  - flatter slopes in areas where the effluent may surface downslope *(section 20 e (1)); and*
  - conformance to the isolation distances presented for domestic systems *(section 19 a).*

ISOLATION DISTANCES (from Table 2 in Sheridan County Rules and Regulations)

From	Feet to Septic Tank	Feet to Absorption Field
Water Wells (including neighboring wells)	50	100
Property lines	10	10
Building Foundations		
Without foundation drain	5	10
With foundation drain	5	25
Potable Water Pipes	25	25
Septic Tank		10
Surface water (including seasonal and intermittent)	50	50

The material presented is for general information purposes only. Please contact the Sheridan County Conservation District, Sheridan County Engineer's Office or the Wyoming Department of Environmental Quality for more information.

INVESTIGATE WATER TABLE AND SOILS

- A test hole provides information on the location of the water table and other soil characteristics.
- Sheridan County Rules and Regulations require:
  - soil exploration to a depth of 4 feet below the proposed absorption system *(section 20 a);*
  - at least three percolation tests at the proposed depth of the absorption field *(section 20 b (1));*
  - the depth to bedrock or impermeable soil be at least 4 feet from the bottom of the absorption system stone AND the natural ground surface *(section 20 c (1));* and
  - the depth to seasonal high groundwater be at least 4 feet from the bottom of the absorption system stone and at least two feet from the natural ground surface *(section 20 c (1)).* Note: it is often necessary to rely on soil indicators (staining, mottleing, or others) to determine the level of the seasonal high water table.

CONDUCT PERCOLATION TESTS

- The percolation test is one of the most important but often overlooked steps in designing a system.
- Excessively permeable soils with a percolation rate of one minute per inch or less may be used if a six inch layer of soil, such as concrete sand, with a rate of five minutes per inch or greater is added between the absorption system stone and the existing soil *(Sheridan County; section 20 d).*
- Sheridan County Rules and Regulations Appendix A provides instructions for percolation tests.
  - Dig or bore a 4 to 12 inch diameter hole, scrape sides and remove loose material, place two inches of gravel or coarse sand in the bottom of the hole. This prevents scouring and sealing.
  - Presoak the holes to a stable water condition that allows the water to seep at a constant rate.
    - For sandy soils, place 12 inches of water in the hole and allow it seep away. Fill with another 12 inches of water. If water seeps in 10 minutes or less, the soil is excessively permeable. If water remains after 10 minutes, maintain 12 inches of water in the hole for at least four hours. After the four hours of water contact, allow the soil to set for 12 hours before starting the percolation test.
    - For other soils, maintain 12 inches of water in the hole for at least four hours. After the four hours of water contact, allow the soil to set for 12 hours before starting the percolation test.
  - After presoaking, pour water into the hole and measure the drop in water level to the nearest 1/8 inch at constant intervals, using a fixed reference point. Continue until the water drop is consistent for three consecutive measurements.
  - The percolation rate = the time interval in minutes / the water level drop in inches.

COMPLETE THE SYSTEM DESIGN AND INSTALL THE SYSTEM

- Using the percolation rate, identify the absorption system loading rate from Figure 7 of the Sheridan County Rules and Regulations or from the Loading Rate Table provided by WDEQ in the "Design Information Package for Small Wastewater Facilities."
- Using the minimum peak design flows and the loading rate, determine the minimum square feet of absorption area needed.
  - For single family dwellings, the minimum peak design flow used to determine the size of the aborption area is 150 gallons per **bedroom** per day.
  - (# bedrooms X 150 gpd) / Loading Rate (gpd.sf) = square feet of infiltrative surface required
- Determine the layout of the absorption area and dimensions. Identify the length of bed or trench, the length of pipe, the spacing between laterals or trenches. Identify the depth of rock, pipe, filter fabric, and back fill required. The WDEQ has worksheets that can be used for some systems.
- When installing the system, it is helpful to compact the soil under the septic tank inlet and outlet pipes to prevent sagging and other problems.

The material presented is for general information purposes only. Please contact the Sheridan County Conservation District, Sheridan County Engineer's Office or the Wyoming Department of Environmental Quality for more information.

SEPTIC SYSTEM OPERATION AND MAINTENANCE

While even the best septic systems do not have an infinite lifespan and eventually have to be replaced, proper care and maintenance of your system can extend the life of the system, prevent failure of the system, and ensure that the wastewater is effectively treated before entering the environment. Proper maintenance of the system does not have to be a time consuming or expensive activity, but it does need to be consistent.

PROTECT THE ABSORPTION FIELD

- Grass should be planted on the absorption field to provide cover; however do not plant trees or shrubs. Their roots can clog and impact the function of the absorption field.
- Driving over or parking vehicles over the absorption field (or any other part of the system) can compact the soils and reduce its ability to filter the wastewater.
- Divert other run-off (from the roof, sump pumps, or other source) away from the absorption field.

PRACTICE EFFICIENT WATER USE

- Using excess water can overload the system and oversaturate the soils in the absorption field. This can reduce the soils ability to remove pollutants, including bacteria, from the wastewater.
- Conserve water and repair leaky fixtures.
- Install low flow toilets and aerators on sinks and shower heads.
- Run dishwashers with full loads and use the load settings on washing machines.
- Wash laundry throughout the week, rather than one day.

MONITOR WHAT GOES INTO YOUR SYSTEM

- The septic system should not be used as a trash can. Solids that go in eventually have to be removed.
- Food scraps and other kitchen waste, cigarettes, paper towels, feminine hygiene products, diapers, dental floss will increase the amount of solid build-up in the tank.
- Garbage disposals are not recommended for use with septic systems. If a garbage disposal is used, more frequent maintenance of the tank will be necessary and the life expectancy of the absorption field will be reduced.
- Additions of grease and cooking oils should be avoided.
- Do not use the septic system to dispose of hazardous household wastes such as paints, varnishes, thinners, pesticides. These substances can be harmful to the bacteria that begin the decomposition process within the septic tank.
- In general it is not recommended to use septic tank additives. In most cases they do not help and may even be harmful to your system.

The material presented is for general information purposes only. Please contact the Sheridan County Conservation District, Sheridan County Engineer's Office or the Wyoming Department of Environmental Quality for more information.

INSPECT AND PUMP THE SYSTEM

- The system should be inspected by a trained professional every one to three years. A thorough inspection will identify potential problems, such as cracked pipes, and examine the condition of the septic tank. The thickness of the sludge, liquid, and scum layers within the tank will determine whether or not the tank needs to be pumped. Always use caution when opening or inspecting the septic tank. Toxic gases from inside can be lethal.

- Determine the location of the system, manhole, and inspection ports if unknown. Once you or a professional have located the system, keep a map or other indicator, so that it can be found in the future. If the manhole and inspection ports are buried, some digging may be necessary.

- Evaluate the plumbing going into the tank (flushing the toilet).

- Determine the thickness of the sludge, liquid, and scum layers within the tank.

- Evaluate the condition of the tank, absorption field, and other components of the system.

- The tank needs to be pumped on a regular basis to remove the sludge and scum build-up within the tank. The tank needs to pumped if the sludge layer is within 12 inches of the bottom of the outlet baffle. The pumping frequency will depend on the number of people living within the home, the amount of wastewater being generated, how much solid waste is added to the system (i.e. through the use of garbage disposals) and the size of the septic tank.

Tank size	1 member household	3 member household	5 member household
1000 gallon	12.4 years	3.7 years	2.0 years
1250 gallon	15.6 years	4.8 years	2.6 years
1500 gallon	18.9 years	5.9 years	3.3 years

Estimated tank pumping frequency in years (from the Pennsylvania State University Cooperative Extension Service). A minimum 1000 gallon tank is required for residences up to four bedrooms in Sheridan County. Smaller tanks, larger households, and use of garbage disposals, will require more frequent pumping.

- A licensed contractor will have the necessary equipment and will be able to dispose of the material at an appropriate site. Keep records of the pumpings, inspections, repairs, and other maintenance. Be sure you have copies of all the necessary permits and documentation. It is the homeowner's responsibility to ensure that the waste is disposed of properly. Refer to the yellow pages under "Septic Tanks and Systems-Cleaning" for inspection and pumping services.

ALTERNATIVE ON-SITE TREATMENT OPTIONS

In Wyoming, more development is occurring in rural areas where on-site systems must be used for wastewater treatment. In some areas, the conventional septic tank and leachfield will not adequately treat wastewater before it enters ground or surface water sources. Problems may result from high groundwater tables or soil types that allow water to percolate through the soil too quickly or too slowly for proper treatment. Alternative wastewater treatment systems have been developed for these situations. There are several options available to Wyoming homeowners wishing to install new or replacement on-site wastewater systems. On most home sites, a number of design options are available for residential wastewater treatment. This fact sheet provides information on a few options and briefly explains how treatment occurs. For more detailed information or regulations/requirements on any of these or other alternatives, contact the Sheridan County Engineer's Office or the Wyoming Department of Environmental Quality.

SEPTIC TANK WITH A MOUNDED ABSORPTION FIELD

- The mounded system is most similar to the conventional system.
- Use where the water table is too close to the soil surface, or when percolation rates do not provide adequate wastewater treatment.
- The absorption field is located above the natural soil surface in a mound constructed of materials that provide proper wastewater treatment.
- Wastewater flows by gravity from the septic tank to a dosing (or pump) tank and is then dosed/pumped up into the mound.
- The wastewater will percolate through a gravel bed and possibly through a bed of washed sand fill, before reaching the natural ground surface.

SEPTIC TANK WITH A GRAVELLESS ABSORPTION FIELD

- Wastewater is treated with a fabric-covered corrugated pipe or a plastic chamber set in a trench.
- In the gravelless pipe system,
  - a corrugated pipe is surrounded by a synthetic fiber; and
  - the effluent is treated in the soil below the pipe; no absorption stone is used.
- In the gravelless chamber system,
  - a chamber made out of a material that will not degrade, typically plastic is used; and
  - the effluent is treated in the soil along the sides as well as below the chamber; no stone is used.
- These systems are easy to install; lightweight components can be carried to difficult to reach sites.
- Storage capacity is greater than traditional leachfields because there is no gravel to occupy the space that water can occupy.
- Chambers in both gravelless and gravel systems have a greater storage capacity than perforated pipe.
- May be at a higher risk for plugging with some soil types.

SEPTIC TANK WITH A CONSTRUCTED WETLAND

- Wastewater is treated in an imitation of an attractive natural wetland.
- Wastewater travels from the house to the septic tank, and then to the constructed wetland.
- The wetland, which may be lined with an impermeable material to prevent untreated wastewater from entering the soil, is filled with rock, gravel, sand and/or soil.
- Cattails, reeds and other aquatic plants remove or take up some nutrients and other contaminants.
- Water is collected from the wetland and distributed to an absorption field or polishing pond.
- May not function as well in the wintertime, in cold climates.

SEPTIC TANK WITH AN EVAPO-TRANSPIRATION SYSTEM

- Wastewater is treated through evaporation from the soil and transpiration of water through plants.
- Use where the soil cannot treat wastewater before it percolates to the groundwater such as in rocky soils, or in clay soils where water percolates too slowly.
- This system can be used in dry climates; it does not work well in wet climates where precipitation exceeds evaporation and transpiration rates. Conditions in Wyoming are marginal
- Wastewater flows from a septic tank to perforated pipes in a crushed stone bed.
- The surface of the bed is covered with a shallow layer of topsoil that can be planted with water-tolerant vegetation. Final treatment and disposal of the effluent occurs as water evaporates from the soil, plants use nutrients, and moisture is released through transpiration.
- As the water evaporates, salts, minerals and solids from the wastewater accumulate in the bed. During very wet periods, the bed stores water until drier periods, when it evaporates and is transpired.

SEPTIC TANK WITH A SAND FILTER SYSTEM

- The sand filter is a good option for additional on-site treatment where a septic tank/leachfield system has failed or is restricted due to high groundwater, shallow bedrock, soils that do not adequately treat wastewater, or other limiting site conditions.
- The typical sand filter is a watertight box, generally concrete or plastic lined, and filled with a specific sand material. It is often shown as a bed type treatment with collection pipes at the bottom.
- The filter may be above ground, partially above ground, or below ground, and the filter surface may be covered or uncovered.
- Wastewater from the septic tank or aerobic unit (see below) is distributed evenly in the bed by pumping controlled doses through a network of small diameter pipes. Wastewater leaves the pipes, trickles down through the gravel and is filtered through the sand. There water is collected and can travel to an absorption field or other final treatment system.
- Sand may need to be replaced periodically.

AEROBIC UNIT OR AERATED TANK

- Aerobic units are sometimes called package treatment plants.
- Aerobic treatment is rapid, odor-free and reduces solids more than anaerobic treatment, which occurs in the traditional septic tank.
- Wastewater is treated through aerobic digestion – breaking down wastes in the presence of oxygen. Aerobic bacteria, those that need oxygen, break down the organic portions of the wastewater into simpler compounds.
- An external air compressor or a pump or stirring device incorporates air into the wastewater.
- Because it uses mechanical parts and energy, it is more costly and requires more maintenance than the traditional septic tank.
- After treatment in the aerobic unit, effluent flows to an absorption field or other final treatment system.
- A third party maintenance agreement is required by WDEQ.

FINANCIAL ASSISTANCE OPPORTUNITIES

GRANTS ADMINISTERED BY THE SHERIDAN COUNTY CONSERVATION DISTRICT

- Federal grants from the US Environmental Protection Agency through Wyoming Department of Environmental Quality under section 319 of the Clean Water Act
  - Grants require non-federal match
  - Cost-share is approximately 50% of the entire project cost
  - Limited to "impaired waterbodies", which include waterbodies in the Tongue River Watershed, the Goose Creek Watershed (including Big Goose and Little Goose Creek), and the Prairie Dog Creek Watershed
  - Limited to use on single family dwellings
  - Existing systems have to demonstrate a significant impact to surface water quality to be considered
  - Landowners work directly with the Sheridan County Conservation District and USDA Natural Resources Conservation Service Sheridan Field office staff for contracting and payments

- State grants from the Wyoming Department of Agriculture and the Wyoming Association of Conservation Districts
  - Grants may be used (in some cases) as match for other federal funds
  - Cost-share is approximately 50% of the entire project cost
  - Targeted to "impaired waterbodies", which include waterbodies in the Tongue River Watershed, the Goose Creek Watershed (including Big Goose and Little Goose Creek), and the Prairie Dog Creek Watershed
  - Limited to use on single family dwellings
  - Existing systems have to demonstrate a significant impact to surface water quality to be considered
  - Landowners work directly with the Sheridan County Conservation District and USDA Natural Resources Conservation Service Sheridan Field office staff for contracting and payments

- Through combination of federal and state grants; cost-share rates can sometimes be higher than 50%.

CLEAN WATER ACT STATE REVOLVING FUND

- Low-interest loans that do not require up front cash or match (can be used to match other grants)
- Eligible applicants include counties, municipalities, joint powers boards, and state agencies
- Project sponsors submit applications and work with State Revolving Fund staff and State Loan and Investment Board
- May require the County or City sponsoring an application for larger systems

USDA RURAL UTILITIES SERVICE, WATER AND WASTE DISPOSAL LOANS AND GRANTS

- Recipients must be public entities including municipalities, counties, and special purpose districts
- Applicants must have the legal capacity to borrow and repay loans, pledge security for loans, and operate and maintain the facilities
- Funds may be used to construct, repair, modify, expand or otherwise improve waste collection and treatment systems.

The material presented is for general information purposes only. Please contact the Sheridan County Conservation District, Sheridan County Engineer's Office or the Wyoming Department of Environmental Quality for more information.

USDA RURAL HOUSING SERVICE, RURAL COMMUNITY DEVELOPMENT INITIATIVE

- Grants made to qualified organizations to serve as intermediaries
- Requires 50% cash match; no in-kind contributions permitted
- Recipient (not the intermediary organization) must be located in an eligible rural area
- Individuals cannot be recipients; nor can funds be used for construction of any type
- Funds could be used to hire personnel to develop and/or maintain local program

USDA RURAL DEVELOPMENT

- Low-income requirements
- Funds to cover some repair and maintenance

EXTRA INFO

The Conventional System – A Septic Tank with Leachfield

The most common type of on-site wastewater treatment system is a septic tank and leachfield, also called a leachfield, seepage bed, or absorption field. When site conditions allow, this is often the most economical method available. Wastewater flows through the plumbing from the home into a watertight septic tank, which acts as a settling area for the wastewater. Heavy materials settle to the bottom of the tank as sludge. Water, other liquids, and suspended solids are found above the sludge. Soaps and grease form a floating scum layer. This physical separation of sludge, liquids with suspended solids, and scum, is called primary treatment.

Bacteria naturally occur in sewage entering the septic tank. They begin to break down organic materials in the wastewater under anaerobic conditions (without oxygen). The settling and bacterial breakdown that occur in the tank prepare wastewater for final treatment in the soil. Wastewater from the septic tank, called effluent, travels through a pipe to the leachfield. The leachfield is a series of trenches (or a bed) filled with gravel and topped with soil. Effluent moves through pore spaces in the gravel and enters the soil, where naturally occurring microorganisms kill some pathogens. The soil helps tie up viruses and some nutrients, such as phosphorous, before the effluent reaches groundwater. Nitrate, another nutrient found in effluent, is water soluble; effluent and precipitation movement will carry some nitrate through the soil.

The type and condition of the soil are important factors for a properly functioning leachfield. Leachfield size is determined by the amount of wastewater generated and soil characteristics. In many traditional septic tank and leachfield systems, gravity moves wastewater through the system. In some situations, a pump may be needed to move wastewater through the system.

Lagoon System or Waste Stabilization Pond

Properly functioning leachfields require that soils have appropriate percolation rates and are normally unsaturated, meaning spaces between soil particles are not all filled with water. Many areas of Wyoming have clay soils with very slow percolation rates. In these situations, a lagoon system may be considered for treating wastewater. Lagoons use both aerobic and anaerobic processes. Aerobic decomposition, requiring oxygen, occurs near the water surface. Anaerobic decomposition occurs near the bottom of the lagoon, where there is little oxygen.

Lagoons can be cost effective to design and construct. Wastewater goes directly from the household plumbing to the lagoon, where algae and bacteria work together to break down the waste. There is typically no septic tank. The heavy solids settle to the bottom of the lagoon where they are broken down by bacteria. Also, bacteria floating in the water decompose the lighter, suspended material while giving off carbon dioxide. Algae use the dissolved nutrients, such as phosphorous and nitrogen, as well as the carbon dioxide. In turn, the algae give off oxygen, providing air for bacteria. Water returns to the environment through evaporation.

Holding Tank

Some homes are on small lots with no suitable soil or space for an effluent treatment system, and no access to a municipal wastewater treatment system. Wastewater from the home is discharged to a holding tank, which

must be pumped periodically. The tank contents, called septage, must be transported to a treatment and disposal system. In Sheridan County, holding tanks are not allowed for new residences. Where holding tanks are allowed, the tanks must be designed to provide seven days storage capacity. This means the tank must be pumped weekly which can be an inconvenience and very costly. Holding tanks must have an alarm or visible float that indicates when the tank is ¾ full so pumping can be arranged.

Waterless Toilets

Composting and incinerator toilets are two types of waterless toilets. These systems may be useful where water is in short supply, or if the homeowner wants to reduce the quantity and improve the quality of wastewater that requires treatment. Most waterless toilets will handle feces, urine, toilet tissues and some other biodegradable materials. A separate system must handle other wastewater from the home. Some composting toilets may handle kitchen wastes in addition to toilet wastes. Heat produced by bacterial activity drives off excess moisture, and reduces the waste to about 5-10% of its original volume. A fan or roof vent carries away odor, gases and moisture. Composting destroys harmful organisms and produces a residue that must be disposed at an approved wastewater treatment facility. Some models need a heater to aid composting. Incinerator toilets use oil, gas, or electricity to burn waste, reducing it to a sterile ash. The ash box must be emptied periodically. These units consume varying amounts of energy and release some odors and gases into the atmosphere, depending on the type and model. A waterless toilet is not a substitute for a septic tank and effluent treatment system.

LOADING RATE TABLE

Percolation Rate (mpi)	Loading Rate	Percolation Rate (mpi)	Loading Rate	Percolation Rate (mpi)	Loading Rate	Percolation Rate (mpi)	Loading Rate
1-5 mpi	.8	19	.47	33	.38	47	.327
6	.75	20	.46	34	.375	48	.325
7	.71	21	.45	35	.37	49	.323
8	.68	22	.44	36	.365	50	.32
9	.65	23	.435	37	.36	51	.318
10	.62	24	.43	38	.357	52	.316
11	.60	25	.42	39	.353	53	.314
12	.58	26	.415	40	.35	54	.312
13	.56	27	.41	41	.347	55	.31
14	.54	28	.405	42	.343	56	.308
15	.52	29	.40	43	.34	57	.306
16	.505	30	.395	44	.337	58	.304
17	.49	31	.39	45	.333	59	.302
18	.48	32	.385	46	.33	60	.30